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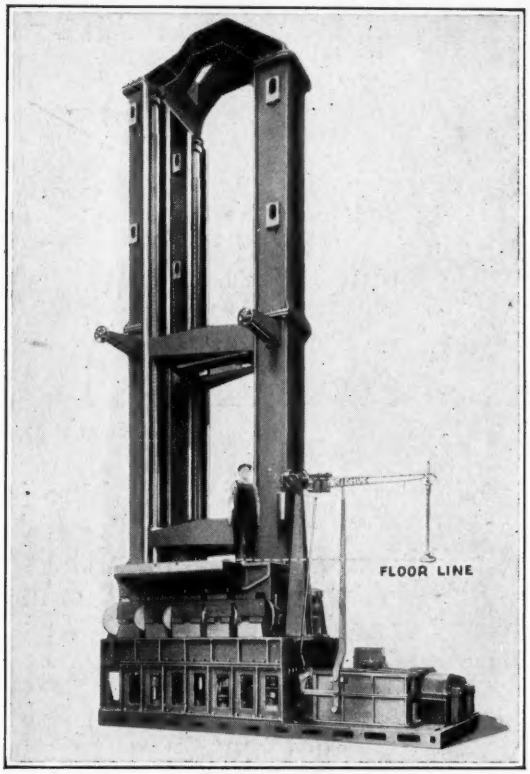
of 2,000,000 Pounds Tensile Strength



This machine was designed by our engineering department for the John A. Roebling's Sons Co. of Trenton, N. J. We are prepared to furnish any kind of physical testing equipment for the wire and wire products industry, regardless of type or size.

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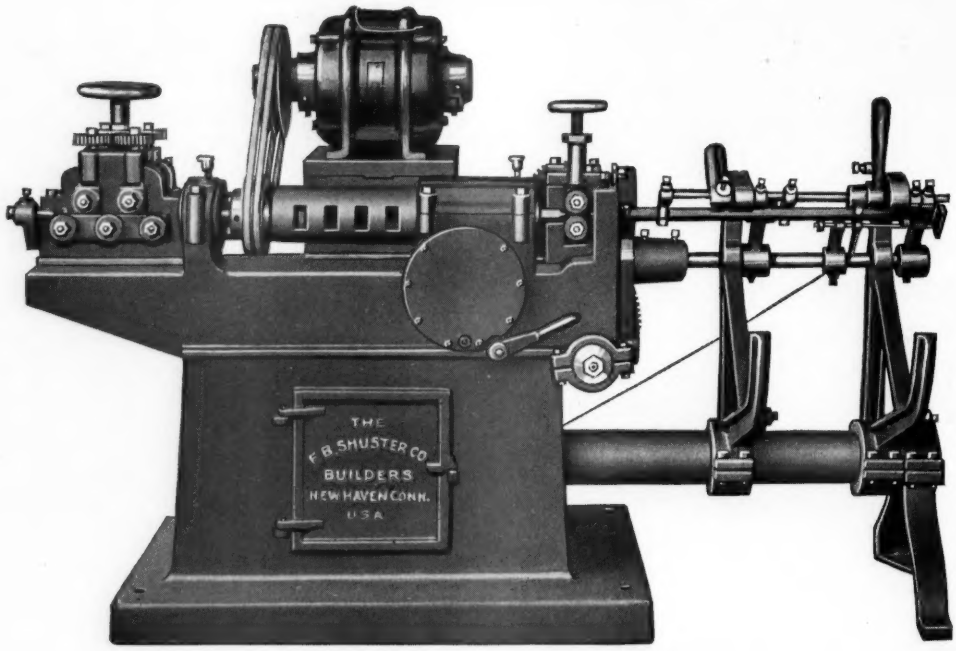

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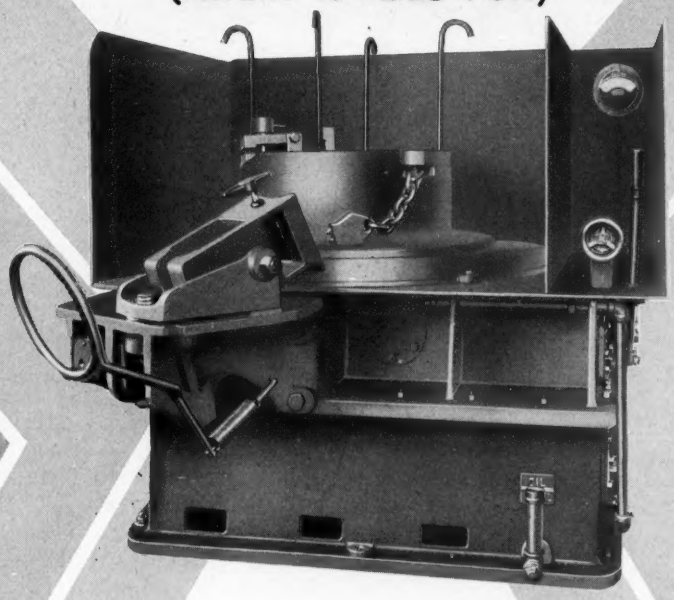

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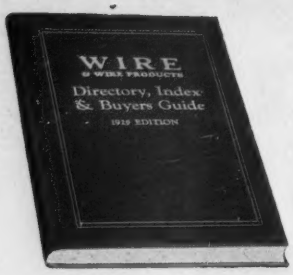

¶ Below is a typical listing from the 1929 Directory

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Brown Engine & Machine Co., Fitchburg, Mass.
Burlingame Machine Co., Worcester, Mass.
Farnham Mfg. Co., Buffalo, N. Y.
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Leiman Bros., 23 Walker, NYC
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MORGAN CONSTRUCTION CO., Worcester, Mass.
NATIONAL-HARRIS WIRE CO., Newark, N.J.
New England Wire Machy. Co., New Haven, Conn.
Richard Mfg. Co., Bloomsburg, Pa.
SLEEPER & HARTLEY, Inc., Worcester, Mass.
Somerville, Wm. E., & Co., Coal City, Ill.
Standard Machinery Co., Auburn, R. I.
Superior Tool & Mfg. Co., Worcester, Mass.
TORRINGTON MFG. CO., Torrington, Conn.
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* * *

"The machinery manufacturer is thus confronted, at the outset, with a problem of disseminating information about what he has to offer. His first task is one of spreading the information broadcast in the industry which the machine is intended to serve, and letting everybody who could possibly be interested in it know all about it, including the special advantages which it possesses compared with older types of equipment.

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"Advertising is, after all, simply a quick, inexpensive means of delivering a message to those whom the manufacturer would speak to personally, if he could."

The Publishers.

WIRE & WIRE PRODUCTS

A monthly publication devoted to wire drawing and wire forming

Vol. 4 October, 1929 No. 10

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UNION WIRE DIE CORPORATION

NEW YORK

WIRE & WIRE PRODUCTS

Vol. 4 OCTOBER, 1929 No. 10

Wire Items Changed In Tariff Revision

New duties apply to bare and coated wire, tinsel wire, nails, tacks, needles, pins and alloys

THE Tariff bill as revised by the majority members of the Senate Committee on Finance and reported to the Senate in September contains some signicant revisions in certain paragraphs reprinted here in full. These supersede the text of the corresponding features of the bill as drafted by the House Committee on Ways and Means reported in **Wire & Wire Products** for June, 1929.

Size of Wire Controls Applicable Rate

Par. 317. All galvanized wire not specially provided for, not larger than twenty one-hundredths and not smaller than eight one-hundredths of one inch in diameter, of the kind commonly used for fencing purposes, galvanized wire fencing composed of wires not larger than twenty one-hundredths and not smaller than eight one-hundredths of one inch in diameter; and all wire commonly used for baling hay or other commodities, one-half of 1 cent per pound. All wire fencing and all wire netting, whether galvanized or not, composed of wires smaller than eight one-hundredths and not smaller than three one-hundredths of one inch in diameter, nine-sixteenths of 1 cent per square foot: Provided, That all wire fencing and all wire netting whether galvanized or not, of a mesh one and one-half inches or greater, composed of wire of a diameter not greater than four and one-half one-hundredths of one inch and not smaller than three one-hundredths of one inch, shall be subject to a duty of five-sixteenths of 1 cent per square foot.

Bare and Coated Wire

Par. 316. (a) Round iron or steel wire, not smaller than ninety-five one-thousands of one inch in diameter, three-fourths of 1 cent per pound; smaller than ninety-five one-thousandths and not smaller than sixty-five one-thousandths of one inch in diameter, 1¼ cents per pound; smaller than sixty-five one-thousandths of one inch in diameter, 1½ cents per pound: Provided, That all the foregoing valued above 6 cents per pound shall be subject to a duty of 25 per centum ad valorem; all wire composed of iron, steel, or other metal, not specially provided for (except gold, silver, platinum, tungsten, or molybdenum); all flat wires and all steel in strips not thicker than one-quarter of one inch and not exceeding sixteen inches in width, whether in long or short lengths, in coils or otherwise, and whether rolled or drawn through dies or rolls, or otherwise produced, 25 per centum ad valorem: Provided, That all wire of iron, steel, or other metal coated by dipping, galvanizing, sherardizing, electrolytic, or any other process with zinc, tin, or other metal, shall be subject to a duty of two-tenths of 1 cent per pound in addition to the rate imposed on the wire of which it is made; telegraph, telephone, and other wires and cables composed of iron, steel, or other metal (except gold, silver, platinum, tungsten, or molybdenum), covered with or composed in part of cotton, jute, silk, enamel, lacquer, rubber, paper, compound, or other material, with or without metal covering, 35 per centum ad valorem; wire rope, 40 per centum ad valorem; wire strand, 25 per centum ad valorem; spinning and twisting ring travelers, 35 per centum ad valorem; wire heddles and healds, 25 cents per thousand and 30 per centum ad valorem.

(b) Ingots, shot, bars, sheets, wire, or other forms, not specially provided for, or scrap, containing more than 50 per cen-

tum tungsten, tungsten carbide, molybdenum, or molyodenum carbide, or combinations thereof, 60 per centum ad valorem.

Tinsel Wire

Par. 385. Tinsel wire, made wholly or in chief value of gold, silver, or other metal, 6 cents per pound and 10 per centum ad valorem; lame or lahn, made wholly or in chief value of gold, silver, or other metal, 6 cents per pound and 20 per centum ad valorem; bullions and metal threads made wholly or in chief value of tinsel wire, lame or lahn, 6 cents per pound and 35 per centum ad valorem; beltings and other articles made wholly or in chief value of tinsel wire, metal thread, lame or lahn, or of tinsel wire, lame or lahn and india rubber, bullions, or metal threads, not specially provided for, 45 per centum ad valorem; woven fabrics, ribbons, fringes, and tassels, made wholly or in chief value of any of the foregoing, 55 per centum ad valorem.

Cut Nails and Tacks

Par. 331. Cut nails and cut spikes, of iron or steel, exceeding two inches in length, four-tenths of 1 cent per pound; cut tacks and brads, bobnails and cut nails, of iron or steel, not exceeding two inches in length, 15 per centum ad valorem; horseshoe nails, and other iron or steel nails, not specially provided for, 1½ cents per pound; upholstery nails, chair glides, thumb tacks, and drawing pins, with heads assembled to shanks, whether finished or unfinished, made wholly or in part of iron or steel of other base metal, 40 per centum ad valorem; nails, spikes, tacks, brads, and staples, made of iron or steel wire, not less than one inch in length nor smaller than sixty-five one-thousands of one inch in diameter, four-tenths of 1 cent per pound; less than one inch in length and smaller than sixty-five one-thousandths of one inch in diameter, three-fourths of 1 cent per pound; staples, in strip form, for use in paper fasteners or stapling machines, 40 cents per pound; spikes, tacks, brads, and staples, not specially provided for, six-tenths of 1 cent per pound.

[Par. 338. Screws, commonly called wood screws, of iron or steel, 25 per centum ad valorem.] (House paragraph eliminated).

Needles

Par. 343. Needles for knitting, sewing, shoe, or embroidery machines of every description, not specially provided for, and crochet needles or hooks, $1.15 per thousand and 40 per centum ad valorem; spring-beard needles, $1.50 per thousand and 50 per centum ad valorem; latch needles, $2.00 per thousand and 60 per centum ad valorem; tape, knitting, and all other needles, not specially provided for, bodkins of metal, and needle cases or needle books furnished with assortments of needles or combinations of needles and other articles, 45 per centum ad valorem.

Common Pins Taxed At 60 Per Cent

Par. 350. Pins with solid heads, without ornamentation, including hair, safety, hat, bonnet, and shawl pins; and pins with head of glass, paste, or fusible enamel; all the foregoing not plated with gold or silver, and not commonly known as jewelry, if of iron or steel, 60 per centum ad valorem; if of other base metal, 45 per centum ad valorem.

Content of Other Metals In Iron and Steel Taxed

Par. 305. (a) In addition to the rates of duty provided for in paragraphs 303, 304, 307, 308, 312, 313, 315, 316, 317, 318, 319, 322, 323, 324, 327 and 3328 of this schedule, there shall be levied, collected and paid on all steel or iron in the materials and articles enumerated or described in such paragraphs:

(1) A duty of 8 per centum ad valorem if such steel or iron contains more than one-tenth of 1 per centum of vanadium, or more than two-tenths of 1 per centum of tungsten or molybdenum, or more than three-tenths of 1 per centum of chromium, or more than six-tenths of 1 per centum of nickel, colbalt, or any other metallic element used in alloying steel or iron: Provided, That phosphorus shall not be considered as alloying material unless present in the steel or iron in excess of 5 per centum, nor shall manganese or silicon be so considered unless either is present in the steel in excess of 1 per centum, or unless either is present in the iron in excess of 3 per centum; and

(2) an additional cumulative duty of $1 per pound on the vanadium content in excess of one-tenth of 1 per centum, 72 cents per pound on the tungsten content in excess of two-tenths of 1 per centum, 65 cents per pound on the molybdenum content in excess of two-tenths of 1 per centum, and 3 cents per pound on the chromium content in excess of three-tenths of 1 per centum.

Testing Instruments

Par. 360. Scientific and laboratory instruments, apparatus, utensils, appliances (including surveying and mathematical instruments), and parts thereof, wholly or in chief value of metal, and not plated with gold, silver, or platinum, finished or unfinished, not specially provided for, 40 per centum ad valorem; drawing instruments, and parts thereof, 60 per centum ad valorem: Provided That all articles specified in this paragraph, when imported, shall have the name of the maker or purchaser and beneath the same the name of the country of origin die sunk conspicuously and indelibly on the outside, or if a jointed instrument on the outside when closed.

Molybdenum and Tungsten

Par. 302. (a) Molybdenum ore or concentrates, 35 cents per pound on the metallic molybdenum contained therein.

(b) Tungsten ore or concentrates, 45 cents per pound on the metallic tungsten contained therein.

A Study of the Causes of Cuppy Wire

Relationship between the die angle and oxygen content of copper rod determines the degree of cuppiness

By Walter E. Remmers
Metallurgical Engineer, Western Electric Co., Inc.,

Paper presented at Fall meeting, Institute of Metals Division, A. I. M. E.

AT various times the defect in wire known as "cuppiness" has appeared and disappeared without the exact cause of its appearance or disappearance being known definitely. This defect is not limited to one particular metal or alloy but instead seems to be found at various times in all of the materials that are drawn into wire. Figure 1 represents cuppy wire made from an aluminum alloy and Figure 2 illustrates copper wire which became cuppy in drawing without intermediate annealing.

Differences of opinion are current among the manufacturers of wire and in the literature, some claiming the source of the trouble to lie in segregation in the wire rod, oxides, sulfides, slag, and such. Others claim that the trouble is created by an unevenness of stress distribution across the section of the wire, usually thought of as being a function of die shape. All of the published work is of a qualitative rather than a quantitative nature. With this in mind, it was deemed advisable to make a study of the shape of the wire-drawing dies, as well as the oxygen of the copper to be drawn.

Experimental

After several methods were tried, it was found that by studying the contour of the butt-end of the rod after drawing, a measure of the "working" across the section of the wire could be made. The butt-end of the annealed rod was not sheared but was sawed off. The end was then smoothed with a fine file so that the plane of filing was perpendicular to the drawing axis. It is to be noted that this method is not an absolute measure of the distribution of cold-working but is a very good indicative means of studying comparative values.

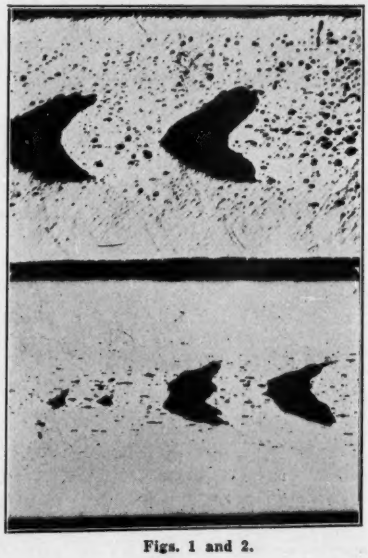
The method of examining a tension break in wire was found to be the most sensitive in detecting cuppiness. Others methods, such as microscopic examination of longitudinal sections, X-ray radiographic studies, etching away of outer layers with nitric acid, and fracture by bending, can all be used to identify cuppy wire but the tension break will give the fracture characteristic of cuppiness before any of the other methods can detect it. Close examination of the surface will frequently reveal cuppy wire but there is a very slight possibility that the surface undulation is due to a relatively large non-metallic inclusion.

When copper wire is in such a condition that none of the usual tests, except a tension break, reveal cuppiness, it can frequently be retrieved by annealing. This is a condition slightly anterior to the stressing to internal rupture.

Among the various conditions studied were straight-sided and curved die contours, amount of reduction per die, the effect of a lubricant, relieved dies, and oxygen content of the copper. Copper rod of the following oxygen contents was used: .019%, .042%, .139%. The .042% oxygen rod is representative of the usual oxygen content of copper wire, the other two are considered extremes.

Straight-sided dies with the included angles varying from 4° to 90° and with all of the reduction accomplished in a single angle were used in drawing the three grades of copper rod. It was found that as the angularity of the die increased, the depth of the butt-end cone increased. This concavity increased until in the extreme cases the wire became badly cuppy in the few dies used. (Figures 3 to 7.)

Several sets of dies were made with the radius of curva-



Figs. 1 and 2.

Fig. 1—Cuppiness in Duralumin Wire. × 66. NaOH etch.

Reduced in four dies from No. 17 (0.045 in.) to No. 21 (0.028 in.) B. & S. gage.

Fig. 2.—Copper Wire Rejected Because of Cuppiness. × 22. HNO_3 etch.

Reduced in eight dies from ¼-in. rod to No. 12 (0.081 in.) B. & S. gage.

Fig. 3 Fig. 4

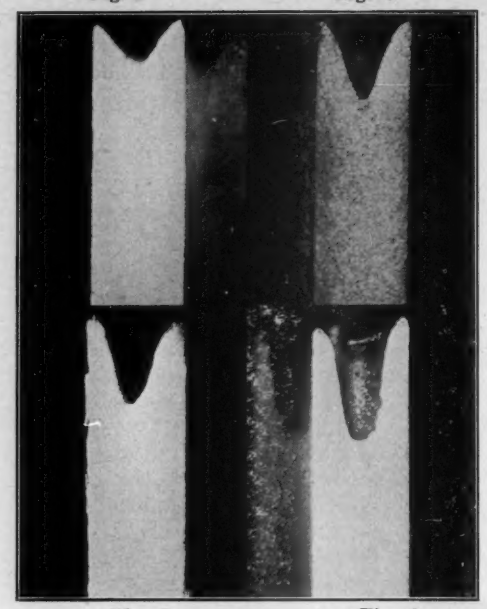


Fig. 5 Fig. 6

Figs. 3 to 6.—Copper rod of 0.042 per cent, oxygen content drawn through different dies. Lubricant was used in all these draws.

Fig. 3.—Drawn through 4° included-angle dies.
Fig. 4.—Drawn through 8° included-angle dies.
Fig. 5.—Drawn through 18° included-angle dies.
Fig. 6.—Drawn through 40° included-angle dies.

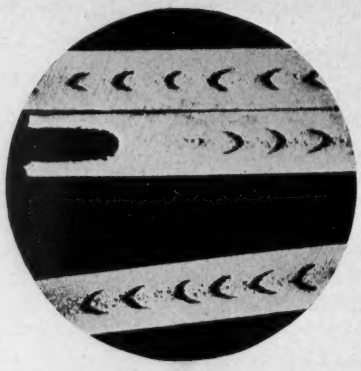


Fig. 7.—Copper Rod of 0.042 per cent. Oxygen content drawn through 50° included-angle dies. Lubricant was used.

ture on longitudinal section ranging from 1/16″ to 2½″. The results follow very closely those obtained from experiments in varying the straight angle. The smaller the radius, the nearer the wire approached to a condition of cuppiness. By comparison with the indentations on the end of straight angle drawn wire, the "effective angle" of these dies can be estimated.

Pantograph for Die Study

A method was devised for recording the longitudinal section through a die without ruining the die for further service. A thirty inch pantograph was mounted on a drawing board with the pencil in the large-motion position and a tapered needle bent 90° in the small-motion junction. This needle carried a T-shaped head. The metal die was supported by clamping to a small iron bracket. It was necessary to center the die by running the needle through the die opening until contact was made all around. The die was then fastened in that position. To determine when contact was first made between the needle and die, it was necessary to connect the needle and the bracket supporting the die to the open ends of a buzzer circuit. As soon as the contact was made a sound was produced. The pantograph was operated from the pencil end by recording a series of contact positions rather than attempting to trace directly the die contour. An example of the graph is shown in Figure 8 where an enlargement of 16 diameters was made. It is to be noted that due to the width of the head of the T, orifice diameters are not magnified to the same extent as the other dimensions of the die.

The influence of the oxygen content of the copper was investigated to determine its role in producing cuppiness. High oxygen has been considered as an aggravating factor but to what extent its influence was exerted has not been previously determined according to published information.

The portion of the rod used in the laboratory experiments was .146″ in diameter and annealed. The size of finished wire was .081″. In some of the mill experiments the wire was drawn as fine as No. 22 gauge. It was found that the rods of different oxygen contents resulted in cuppy wire when drawn through dies of different included angles. This presents the fact that the effect of oxygen as an aggravating factor in the production of cuppy wire might be measured in degrees of die angle. (Figure 10.)

It should be noted that the solid-line curve is for the five draws used in these experiments and not for any number of reductions. By further reduction of the wire to finer sizes, the solid-line curve, as shown, will be moved considerably to the left, somewhere in the region of the dotted lines. The positions of these dotted lines were approximated by the results of experiments made in the mill and by interpolation. These positions are not established with the same degree of accuracy as that of the solid-line curve.

The usual reductions as used in production were compared with larger and smaller reductions. The usual reduction was accomplished in dies of about 20% reduction in cross-sectional area for each draw. The amount of reduction was increased in one set of dies and decreased in another, the die angles being held constant in each experiment. It was noted that the larger the reduction per die, the more uniformly distributed will be the cold-working of the metal and with that greater remotence from a cuppy condition.

Study of Lubricants

A study of the effect of the so-called lubricants was made to determine the effect, if any, upon the distribution of cold-work-

ing across the section of the wire. A comparison was made by drawing with and without lubricant. The lubricant was the same beef-tallow soap emulsion used in production and was heated when used in these experiments. There was no measurable difference between the two indentations.

Turpentine with its decided anti-lubricating properties was then tried in place of the lubricant and even though the pull on the die increased somewhat, the difference in butt-end indentation was found to be slight. From this one might say that the influence of the lubricant in determining the distribution of working is almost negligible, considering lubricating properties alone.

Effect of Die Changes

Several draws were made to see if a relieved die was to be more desired than the abrupt discharge which is frequently found in chilled-iron wire drawing dies. These dies were relieved by straight angles and by smooth radius curved surfaces. It appeared that a relieved die tends toward a deeper indentation which, of course, indicates an undesirable condition. A slight increase in power consumption was also recorded. The results are similar, both for straight-sided dies and smooth-curved dies.

By reversing the wire each time it was drawn through successive dies, one might think that perhaps some of the deleterious effects of wide-angle dies would counteract the effect remaining from the previous draw since the direction was reversed. In all cases where the direction of drawing was changed, the copper became cuppy one die earlier than it would have had a single direction been used. This cup is characteristic of genuinely cuppy wire.

Numerous new and used chilled-iron dies were examined. These dies were reamed with two straight edged reamers to form the working section of two

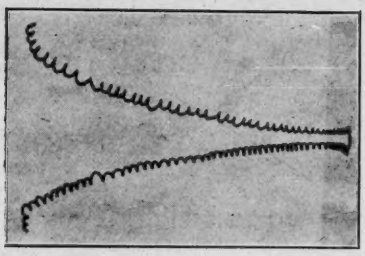


Fig. 9.—Pantograph Record of Shape of 0.072-in. Die. × 16.

(Reduced 25 per cent. Original magnification given)

conical surfaces. In many of the new dies the axes of the two conical shapes were not coincident, making the die contour a shape composed of two oblique conical frustra instead of right conical frustra. This obliquity results in an elliptical wire instead of a circular one, as well as an eccentricity of reduction. This is also apparent in the butt-end indentation of wire drawn through this type of chilled-iron die.

In the discarded dies an annular groove is noted in almost every die just at the point of contact of the copper. The formation of the groove rapidly increases the abruptness of reduction but within the usable limits, the "effective angle" of the die is slightly decreased. This can be explained by the wearing away of the sharp angular junction between the approach and the land, resulting in a smooth-curve reduction. The presence of reamer marks in the new dies contributes also to the difference of "effective angles".

The fact that the so-called "good" wire produced from these dies is in a condition very similar to that of the cuppy wire can be seen in X-ray patterns not illustrated here. The corresponding patterns from the outside and from the inside of the "good" and the cuppy wire are almost identical. This means that the "good" wire examined is in a highly strained condition with a definite orientation at the core but almost no regular order of crystals at the surface. In the most desirable condition, orientation should be apparent in surface of the wire as well as the core.

Summary

There is a definite relationship existing between the die angle and oxygen content of copper wire rod, which determines whether or not the rod can be drawn into good or cuppy wire. This relationship can be altered by various factors, smooth-curve contour dies and large reductions per die acting to give a better product, while relieved dies, reversals of drawing direction and many reductions tend to make a product of lower quality.

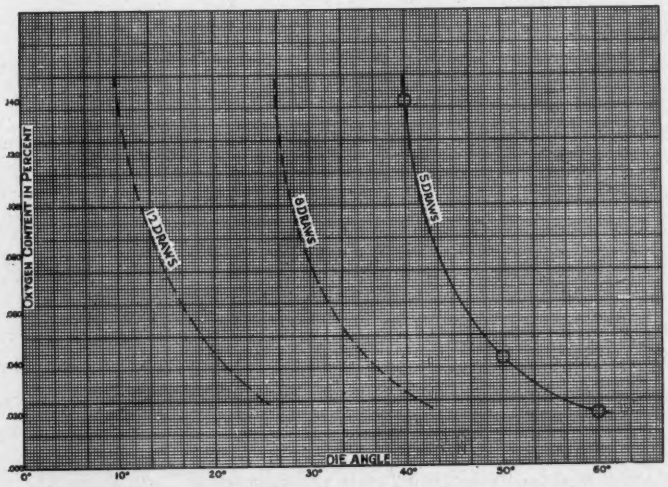


Fig. 10.—Relationship between effective die angle and oxygen content of copper. Wire is cuppy to right of curve.

Modern Tendencies In Wire Drawing

A discussion of the relative merits of various types of wire drawing machinery in current practice

By L. D. Granger
Wickwire Spencer Steel Co., New York City

THE theoretical possibilities of the "almost perfect" wire mill is ever a fascinating subject of discussion in the industry. This very interesting contribution on the modern trend in wire drawing practice is offered, as the author indicates, as a basis for calculation and decision and to afford an opportunity for discussion. Mr. Kenneth B. Lewis, Manager of the Wire Machinery Department of the Morgan Construction Company, differs with some of Mr. Granger's conclusions and will comment on them in the November issue. Other criticism, suggestions and questions from interested readers will also be welcomed for publication.

SO much has been claimed and so little really substantiated regarding the claims of various manufacturers of wire drawing machinery—continuous and otherwise—that it would seem that a fairly complete analysis of the factors involved and a calculation of the limiting production based upon theoretically perfect conditions, would serve as a basis for evaluating the various types offered, and a comparison of their relative merits.

Wire drawing is what might be called a metamorphic type of operation, in that it is not a process of assembling parts more or less unrelated in shape, neither is it a process of taking away any of the original material as in tool making or wood turning. For every hundred pounds of wire or rods of one size started, we expect theoretically to finish one hundred pounds of the new size of wire, the only difference being the smaller diameter and the longer length. Nothing is added, and nothing is taken away, so the problem is simply one of efficiency in changing the size of the section.

As we are to consider only theoretical possibilities, we will not now take into account the effect of poor cleaning, die troubles, inefficiency of operators, nor the thousand and one minor and major difficulties that make the wire drawing art so interesting.

The first consideration is apt to be startling to us. The problem really encountered in wire drawing production is not one primarily of the number or the speed of the blocks, or the amount of reduction per draft, although these are important in their places. The question is rather that of speed and ease in handling material, as it is only by saving time in the nonproductive parts of wire drawing that we can increase production on either a frame or a machine.

Advancement in the Art

The fact has been very well demonstrated in the history of the wire drawing art. In early days when the lengths to be drawn in one continuous piece were short, so much time was taken up in preparing each successive length, that the actual running time of the blocks was practically negligible, and productions were measured in pounds a day instead of in tons. As developments were made in hot rolling mills, and the lengths obtainable in rods increased by means of continuous rolling, the running time of the bundle increased, and the wire drawer found that he had a breathing space between bundles. As a result more and more blocks were given him until the limit was reached by his inability to lift more weight in the course of the day's work.

This condition existed for some time, and a very complete survey was made by one of the large companies to determine just how much work a man could be called on to do in a day in the way of lifting without seriously shortening his working life. As we remember, this figure was 30,000 pounds.

In addition to this, the wire drawer was supposed to calculate, in multi-draft work, the proper distribution of his drafts so that his blocks would be kept busy as much of the time as possible. This resulted in the condition so troublesome to every mill man—two men on the same job varying greatly in production. The "rare bird" among wire drawers was the more intelligent workman who, instinctively or otherwise, looked ahead, and kept his blocks running at maximum efficiency, and at the same time was sturdy enough to strip and load 300 pound coils.

Almost overnight, after the war, brain and brawn became divorced, and the man with the intelligence to plan sought other less laborious occupations.

Various expedients, stripping blocks, jib cranes, high speed motor driven blocks were all tried, but no appreciable bettering of production figures and consequent lowering of costs was attained. The old routine persisted, even though the laborious part of the job was eliminated. We still expected the wire drawer to be a mathematician in figuring out how many blocks to run on each draft, and we all know how much variation there was in different men

in this regard, and how their productions differed.

So far, however, only expedients had been applied; we still stopped the block after every draft, stripped the bundle, and loaded it onto the next reel for the next draft. The various developments in handling equipment and refinements in details represented only a more or less blind groping around to find the answer to a problem whose exact nature was not fully known.

Among the innovations was the development of the continuous machine for coarse gages, the principle having been long used for the fine sizes, with the idea that one lifting of the rod bundle onto a swift, and one stripping of the finished bundle of wire by means of a crane from a stripper block would be all the mechanical work required of the man. The rest of his time, while the machine was drawing the wire, could be spent in tying up the bundle of wire left suspended in the air on the crane, and in preparing the next bundle of rods on a second swift, to be started as soon as the last end of the first bundle was through the first hole of the machine. And it is with this type of equipment that we wish to make a few figures and draw a few deductions in this study.

Two Types of Operation

Wire drawing is made up of two distinct types of operations: first, those of preparation and disposal, and second, that of actual drawing. The first set of operations has aptly been grouped under the name of "chores" by Mr. K. B. Lewis of the Morgan Construction Company in a paper published in the Iron Age of October 12, 1925. His analysis develops the theory that the only factors entering into wire drawing from a production standpoint are the weight of rod bundle, and the time necessary for doing the chores. That this is correct will be taken as granted, provided the analysis is not carried further on economic considerations such as cost of equipment, floor space, interest on the investment, etc. According to this theory, a man could keep an infinite number of machines in operation, once they were started, and the dies did not cut out, if the length of the bundle were infinite. Fortunately, rod bundles have a definite length, and a definite time is necessary to perform the chores, so we are relieved of the necessity of considering infinity.

A Concrete Case

Theoretically, then, we may consider that all the wire drawer has to do is his chores, that the mathematics are set for him, and that the machines take care of all the wire he can put on and take off. Under these conditions, his production is limited only by the number of bundles for which he can perform the necessary chores, or to use Mr. Lewis' notation and formula,

$$(1)\quad X = \text{Number of bundles} = \frac{M}{T + P + B}, \text{ where}$$

M=number of minutes in the working day
T=minutes required to thread
P=minutes required to put bundle on reel and point
B=minutes required to strip, tie up, and load finished wire
T + P + B="Chores"

In a concrete case, to see where this leads us, we are informed that one type of machine required "5½ to 9 minutes to strip the finishing block, load the feed reel, point the wire, thread the first two blocks, point the wire again, and thread through to the finishing block." This statement is from a consulting engineering firm, and may be regarded as authentic. To start with, then, we may have theoretical productions varying almost 82%. Solving the equation with the two values gives us 109 bundles a day for the 5½ minute chore time, and 66⅔ bundles a day for the 9 minute chore time. Now, suppose the bundles to weigh 300 pounds, we have as limiting productions 32,700 pounds in the first case, and 20,000 pounds in the second, per day per man, regardless of speed of block, size of wire or any other consideration whatever except that he have all the machines necessary and that every minute is usefully employed. These facts are of course granted in this discussion.

Now, in order to increase theoretical production, we must do one of two things; either increase the weight of the bundle —which has infinity as its upper limit—or decrease the time taken for the chores—which also has infinite production as a limit through a fraction with zero as a denominator. Our maximum, therefor, is somewhere this side of infinity, and determined by practical considerations of the two factors.

Heavier Rod Bundles

Recent improvements in rod mills have resulted in a rod bundle of 400 pounds weight. Experiments in welding bundles together have been moderately successful in increasing the effective weight up to a ton or more. Further developments are in progress which will increase the weight of the bundle delivered from the rod mill, thus furnishing a longer bundle without the doubt occasioned by the welding operation which is not 100% effective.

To come to a workable maximum, let us consider averages, and not the obviously impossible. As our premises, we will consider a 300 pound rod bundle available, and that the total time for the chores is the average of the figures cited, or 7¼ minutes. Applying the formula,

then, we obtain 600 minutes in a ten hour day, divided by 7¼, resulting in a theoretically possible production of a little over 82 bundles per day or nearly 25,000 pounds. As the maximum production claimed by any of the manufacturers that we have seen is only in the neighborhood of 12,500 pounds of No. 14 wire —and this is cited as a record, rather than an average production—we evidently have an inefficiency of 50% for which the manufacturer should account.

In order to understand conditions, it is necessary to give a little study to what might be termed the "mathematics" of wire drawing.

The Mathematics of Wire Drawing

In frame drawing when each draft is to be considered as an entity, the theoretically possible production is the total feet delivered by the combined blocks, divided by the total feet per pound of the various drafts—thus

$$(2)\quad P=\frac{5Pi\ (R_1D_1+R_2D_2+R_3D_3+\text{etc.}}{F_1+F_2+F_3+\text{etc}}$$

in which

R_1=RPM first block

R_2=RPM second block.

R_3=RPM third block, etc.

D_1, D_2, D_3, etc=dia. of blocks in inches

F_1, F_2, F_3,= ft. per pound of first, second, third drafts, etc.

P=pounds per hour

The production of a 5 block frame whose blocks run 55 RPM 22″ dia. drawing four drafts to .080 would be as follows:

Ft/min. 22″ block running 55 RPM=316.6

5 blocks=1583

Ft/hr.=94,980

Drawing 4 drafts to 14 gives us

	dia.	Ft./lb.
F_1	.158	15.0
F_2	.120	26.0
F_3	.098	39.0
F_4	.080	58.6
Total Ft/lb.		138.6

$$P=\frac{95040}{138.6}=685.0$$

Or, in ten hours, 6850 lbs., allowing no lost time, and no time for loading, stringing, etc.

Observations differ as to the length of time taken for loading, pointing, stringing, etc., but the following is not improbable.

(1) Putting rods on reel, finding first end, pointing, pulling end through die, starting, fastening end of wire on block, and starting ..... 5 min.

(2) Stripping after first draft, pointing, starting, etc.... 2½ min.

(3) Do. after second draft ..... 2½ min.

(4) Do. after third draft ..... 2½ min.

(5) Stripping after last draft, splitting, tying up and loading. ..... 6 min.

Total time for "chores" ..... 18½ min.

If we start with 300 pound bundles, the maximum number of bundles possible a day by formula 1 is

$$\times=\frac{600}{18.5}=32.43$$

or 9729 lbs.

As the production of the 5 block frame running 100% of the time is only 6870 lbs., we at once cut the man's efficiency to 71%, giving him nearly 26 minutes for the chores on each bundle instead of 18½, and indicating that he could run more blocks if he had the inclination and strength.

The Human Factor

The amount of unavoidable down time for each block will vary with the individual wire drawer. Assuming that he is industrious, has plenty of additional swifts, and utilizes the spare time in preparation of the wire for the actual stringing, we may have only five or six minutes necessary for the pull out and starting of the blocks for each bundle.

The actual running time for each bundle will be

	Dia.	Minutes
1st draft	.158	14.2
2nd draft	.120	24.6
3rd draft	.098	33.7
4th draft	.080	55.4
Unavoidable down time		6.
		133.9

and the bundles possible a day will be $\frac{600\times5}{133.9}=22.4$, or at 300 lbs. a bundle, 6720 lbs., which checks very closely with the production of a good wire drawer.

During this time, he has lifted each bundle off the blocks four times, which brings his daily lifting effort very nearly to the 30,000 pound endurance limit.

We are thus brought to a maximum production on the frame by two limiting factors—endurance of the man, and possible output of the equipment. From this will be seen why, somewhat to the discomfiture of some designers, the expedients of stripping blocks, jib cranes, and higher speeded blocks did not materially increase production.

In order to increase productions, we must

1. Cut down unavoidable lost time
2. Increase the number of blocks
3. Increase the weight of the bundle

The first has for a goal only 6 minutes out of 127, or 4.7% increase; the second, considering frame production only, a limit of about 7 blocks that can be usefully employed, and the third a not very great practical increase at the present, though theoretically important. This condition may change greatly with improved types of dies, and is a question for the future to answer.

Continuous Machines

During the search for the answer to the demand for lighter work and greater production, many types of machines were introduced. Two blocks were mounted on a turn table adapted for use alternately as drawing block and reel, and motor driven single blocks with variable speed motors enabling higher running speeds through slower starting were furnished. These all helped in the development, but the equipment which seems to give the best promise

(*Please turn to page 352*)

Selling Wire Fence From the Sky

Novel idea in advertising gives the farmer a new conception of his wire fence needs

Reprinted from "Printers' Ink."

NOT so many years ago we were accustomed to the somewhat stiffly grouped airplane-automobile-locomotive pictures, which then symbolized twentieth century "progress" and "speed." Now, in the advertising which the American Steel & Wire Company is running in farm papers on its zinc insulated fences the airplane drops its locomotive and automotive associates and enters the picture, not as a symbol of grace or progress or speed, but as a simple, direct sales appeal in itself.

A New Glimpse of the Farm

"How Would Your Farm Look from an Aeroplane?" is the abrupt query which makes up the headline for this series. This is certainly a new slant, so far as the farmer is concerned. No longer can he lean lazily on his pitch-fork and appraise his eighty acres. Now he must, figuratively at least, jump in his plane and take a couple of spins around the place to be sure of what sort of shape it is in.

In its daily job of selling wire fences, the American Steel & Wire Company has not quite reached the point where it is ready to make pride and aesthetic beauty the fundamental appeal in fence advertising.

Fence is a pretty staple product—one of the essentials in successful farming. Still it can be approached from a modern angle, which is what this subsidiary of the United States Steel Corporation is trying to do.

The company has learned in its many years' study of the relation of fence to profitable farming, that the well-organized, scientifically cultivated farm presents a neater appearance when seen in bird's-eye view. What could be more appropriate, then, in this air-minded age, than to ask the farmer to consider how his farm would look from an airplane? For if it presents the proper appearance from that point of view, it undoubtedly presents an equally proper appearance from the more important viewpoint of agricultural wisdom.

The Space Used in This Farm-Paper Series is filled by an Airplane View Illustration.

The airplane focus is but an indirect way of getting at the really vital point of whether the farm is being operated in a systematic, efficient manner. In addition, this "sky angle" naturally has all the attention advantages of being graphic and highly contemporaneous.

How Wire Fence Serves

Half the space used in this series is filled by an illustration of how a well-laid out farm does look from the air.

The copy beneath the illustration sells fences, not beauty or air-mindedness or any other romantic abstraction. A paragraph directly beneath the picture, explaining it and leading directly into the straightaway merchandising of the service which wire fence performs, says:

"In your vicinity are certain farms that pay real dividends—and others that operate at a loss. From an aeroplane you could easily determine why this is so. The poorer farm would appeal to you as a confused and irregular jig-saw puzzle—the prosperous one would show clearly the defined fields and pastures divided and controlled by fence."

After which the airplane idea is dropped for this:

"The need for fence is too vital to be overlooked—or even postponed, for under present conditions the difference between profit and loss depends upon securing the utmost value from every acre of land. The rotation of crops—the condition of livestock and the hogging down of corn, are a few of the essentials in profitable farm operation that the proper use of fence makes possible."

A Timely Campaign

Even though many of our readers may not know much about the hogging down of corn and other such agricultural niceties, it requires no great imaginative effort to form the conclusion that this is talking farm language. In other words, in this campaign the airplane is not a symbol or a mere trick for catching the eye; it represents a point of view, a fresh point of view on a straightaway fence merchandising story.

This campaign, which has just started, will run on into the month of October. Knowingly or unknowingly, a more fortunate time could scarcely have been selected for it, for certainly the flight of the Zeppelin has charged the air with an awareness to aircraft such as nothing before has ever done. Lindbergh was read about; the Zeppelin was actually seen, by millions, in farm areas as well as in concentrated city sections.

NEWS *of the* INDUSTRY

Foreign Trade Opportunities

FOREIGN trade opportunities reported by the U. S. Bureau of Foreign and Domestic Commerce during the month of September include inquiries from the following sources: Bolts, nuts and nails (40609) from Shanghai, China; steel bolts and nuts (40643) from Glasgow, Scotland; bolts and nuts and blanks for bolts and nuts for airplanes (40610) from Calgary, Canada; for wire cable (40656) from Pretoria, South Africa; for galvanized wire (40749) from Nuevitas, Cuba; for iron wire (40755) from Caracas, Venzuela; for bolts and nuts (40788) from Berlin, Germany; for insulating wire and cables for automobiles (40992) from Berlin, Germany; for steel fence wires (40911) from Tegucigalpa, Honduras; for machinery for making electrical wire, for braiding and insulating, and for the making of rubber insulation (41007) from Milan, Italy; for nail and barbed wire manufacturing machines (40986) from Ancon, Canal Zone; for enameled electric wire (41029) from Copenhagen, Denmark; for wiring devices, flexible and rigid conduits (41028) from Sao Paulo, Brazil; for barbed wire, woven wire fencing, wire nails and staples (41068) from Maracaibo, Venezuela; for steel wire rope (41077) from Amsterdam, Netherlands.

New Iron Alloy Research

A far reaching program for research in iron alloys is announced by the Engineering Foundation, New York. The committee in charge, which will be headed by Dr. George B. Waterhouse, Professor of Metallurgy in Massachusetts Institute of Technology, will inquire into "all basic data on iron and its very numerous combinations with other metals and certain metalloids". It is planned to spend five years and $150,000 in the initial stage of the work, in which the committee will have the cooperation of the industries, engineering societies, universities and the government. The immediate task will be the culling of the important printed knowledge of alloys to be put into forms convenient for use by research workers, technologists, engineers and superintendents. As a second part of the undertaking, the committee will aid, promote and organize research for new basic information about pure iron and its combinations with other substances. It is expected that the work of the committee will enable American industry to maintain a strong position in alloy irons and alloy steels.

Radio Pins Standardized

A national standard for radio tube bases has just been formally approved by the American Standards Association following the preparation of the standard by a technical committee under chairmanship of Dr. Alfred N. Goldsmith, vice president of the Radio Corporation of America. The standard provides that the large pins of the tube bases shall be .156 inches in diameter and the small pins .125 in diameter. This applies to both the large and small types of tubes. The standard also provides that the diameters of the pins must not be more than .003 inches larger or smaller than the normal.

Personal Mention

Wallace S. Clark, manager of the cable division of the central station department of the General Electric Co., Schenectady, N. Y., has resigned and will be succeeded by F. H. Winkley. Mr. Clark will hereafter devote more time to special negotiations and consulting work as general consultant in the cable section.

Rumsey W. Scott, president of the American Cable Co., has resigned to become vice president of the Commercial Investment Trust Corporation New York City.

Obituary

George M. Johnston of the sales department of the Wickwire Spencer Steel Company died September 13 at the age of thirty-six. Mr. Johnston was formerly in the employ of the Clinton Wire Cloth Co., and was superintendent of the plant when it was absorbed by Wickwire Spencer.

Frederic R. Wickwire, Vice President of Wickwire Brothers, Cortland, N. Y., died at his home there September 17, aged 46 years. He was the son of the late Chester F. Wickwire, a pioneer wire manufacturer, and had been associated with Wickwire Brothers since his graduation from Yale in 1905.

Page Claims Trade Mark

Page Steel & Wire Company, Bridgeport, Conn., has applied to the United States patent office for the exclusive rights to their trade-mark, claiming use since July 1, 1883. The emblem consists of the word "Page" in distinctive lettering.

Building and Expansion

Nachman-Springfield Corporation, Chicago, manufacturers of bed springs, etc., report orders on hand as the highest in the history of the business. Plans are being made to step up production in order to catch up with the demand for mattress units.

American Chain Company, Inc., and associated companies, announce the removal of their Chicago offices to the Chicago

Daily News Building, Room 1765. Page Steel & Wire Company is among the associated units affected.

Simmons Company, Kenosha, Wisconsin, manufacturers of bed springs, bedding, etc., recently made a single shipment of mattresses to the Pacific Coast that required a special freight train of fifty cars, the cargo representing a value of $200,000. Production of the new mattresses at Kenosha has now reached 3000 a day, supplemented by the output of the factory at Elizabeth, N. J.

Reading Chain & Block Corporation, manufacturers of overhead conveying equipment, announce the appointment of George R. Harrison as Cleveland representative with offices at 362 Rockefeller Building.

The recently organized Union Wire Die Co., Ltd., of Hamilton, Ontario, Canada, located at Cavell and Barton Avenues, is completing a plant for the manufacture of Un-Widia wire drawing dies which will be in operation on or about October 1st.

Wheeler Insulated Wire Co., 378 Washington Ave., Bridgeport, Conn., has purchased and is remodelling a plant to be used for an experimental station and laboratory for the development of new wires and wire manufacturing methods. The building will add about 15,000 feet of floor space. Olaf Isachsen, former factory manager for the Strand & Sweet Mfg. Co. of Winsted, Conn., will be in charge of the experimental work in the development of methods for drawing, enamelling and insulating electrical wire for motors, transformers, radios, and telephones.

Marion Insulated Wire & Cable Co., Marion, Ind., unit of Anaconda Wire & Cable Co., New York, is being developed for increased capacity.

Standard Underground Cable Co., Pittsburgh, Pa., will build a two story addition to its Perth Amboy, N. J., plant at an estimated cost of $50,000 with equipment.

COMING EVENTS

October 8-11. Annual meeting. National Association of Ornamental Iron and Bronze Manufacturers at St. Louis. Executive Secretary, Thomas R. Charshee, 1331 G Street, N. W., Washington, D. C.

October 14-16. National Assn. Manufacturers of the United States at New York. Secretary, J. Lewis Bentor, 11 W. 42nd St., New York.

October 7-12. First National Electrical Exposition to be held at the Grand Central Palace, New York City, under the joint auspices of the Electrical Board of Trade of New York and the New York Electric League. Address E. F. Korbel, 441 Lexington Ave., New York City.

October 18. Open meeting of the Metallurgical and Mining Advisory Boards to the Carnegie Institute of Technology and the U. S. Bureau of Mines at Pittsburgh. Secretary, John D. Beatty, Carnegie Institute, Pittsburgh, Pa.

Oct. 21-24. National Hardware Assn. and affiliated organizations at Atlantic City. Secretary, George A. Fernley, 505 Arch St., Philadelphia, Pa.

October 15-17. Bridge and Building Supply Men's Assn. at New Orleans. Secretary, I. B. Tanner, 332 S. Michigan Ave., Chicago, Ill.

October 21-26. Railway Electrical Supply Manufacturers' Assn. at Chicago. Secretary, Edward Wray, 9 S. Clinton St., Chicago.

October 23-25. Sixteenth National Convention of the Society of Industrial Engineers at the Hotel Statler, Cleveland, Ohio. Further information may be obtained from the Society of Industrial Engineers, 205 W. Wacker Drive, Chicago, Ill.

October 29. World Engineering Congress, Tokio. Japan. George W. Fuller, Chairman American committee on attendance, 170 Broadway, New York City.

December 2-6—Annual meeting of the American Society of Mechanical Engineers at the Engineering Societies Building, 29 W. 39th St., New York City. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

December 2-7. National Exposition of Power and Mechanical Engineering at New York. Address Charles F. Roth, 420 Lexington Ave., New York City.

December 18. International Assn. Municipal Electricians at Boston. Secretary, H. N. Lang, City Hall, Orlando, Fla.

Baird Machinery Co., 1700 Stratford Ave., Bridgeport, Conn., manufacturers of special machinery for forming wire products, etc., will build and additional one-story plant at an estimated cost of $100,000.

National Umbrella Frame Co., Belfield Avenue, Philadelphia, has awarded contract for a two-story factory addition.

Providence Insulated Wire Co., Wadsworth Street, Providence, R. I., will build and equip a two-story factory addition at an estimated cost of $25,000.

Lindsay Wire Weaving Co., Aspinwall Avenue, Cleveland, Ohio, has awarded contract for additional factory building to cost about $65,000 with equipment.

Gary Bolt & Screw Co., 2217 West Forty Third Street, Chicago, is about to build and equip a new one-story plant.

Wolverine Bolt Co., 9660 French Road, Detroit, is planning to build and equip a new factory unit at an estimated cost of $70,000.

Mid-States Steel & Wire Co., Oak Street, Crawfordsville, Ind., is reported to be planning a factory addition to be built and equipped at a cost of about $40,000.

The Anaconda Wire & Cable Co.'s plant at Sycamore, Ill., is installing new wire drawing and finishing equipment as part of a new plan of expansion.

Superior Spring & Mfg. Co., of Hartford and New Haven, Conn., has purchased site for a new plant to be built and equipped at an estimated cost of $45,000.

A-A Wire Co., unit of General Cable Corporation, Graybar Building, New York, has purchased and will develop the insulated wire and cable plant it now occupies at Kingsland Avenue and Hamilton Street, Harrison, New Jersey.

Sleeper & Hartley TRADE MARK

Practical Wire Wo

These Machines Go Into Production at On ce—

Continuous Rod Frame

(No. 5—14 or 15 wire)

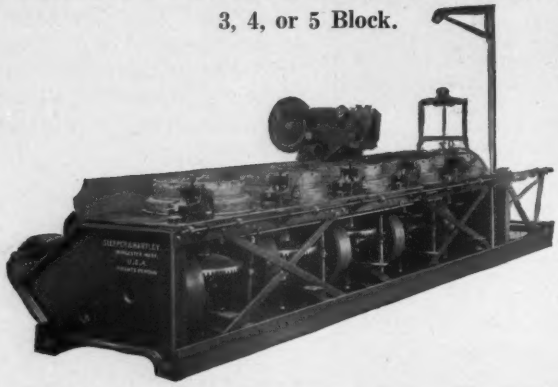
Patented June 3, 1924—May 12, 1925—others pending

All Ball or Roller Bearings

No Differential Gearing.

Automatic Compensation for Speeds of Heads.

3, 4, or 5 Block.



Single Hole Drawing

Standard Rod Frame—10 Block

Long, Stiff Spindles, in anti-friction bearings, and equipped with friction Clutches. Powerful and reliable. Practically noiseless in operation.

(New Plant of Thompson Wire Co., Worcester, Mass.)

D

Spring Coiling Machinery

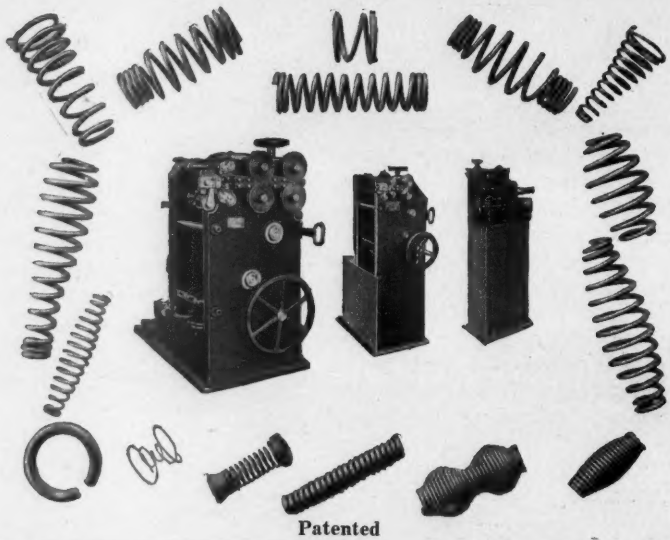
of every description

For example, we offer:

Universal Spring Coiling Machines

in ELEVEN Sizes

handling oil-tempered wire from .004" to ⅝" diam. These machines produce spring forms as illustrated herewith at very high productive speeds.



Patented

The

All inq ir

CHICAGO TERRITORY
Neff, Kohlbusch & Bissell, Inc.

San Francisco:
L. G. Henes Machine Tool Division of Jenison Machinery Co.

Los Angeles:
L. G. Henes Machinery Co.

FOREIGN AGENTS AND REPRESENTATIVES: UNITED KINGDOM—Mr. Fredk. A. Perry, 63 Queen Victoria St., London, E. C. 4.
AUSTRALIA AND NEW ZEALAND—Edwin Wood Pty. Ltd., Melbourne
MONTREAL AND TORONTO—Arthur Jackson Machine Tool Co.
JAPAN—Andrews & George Co., Tokyo

SLEEPER & HA

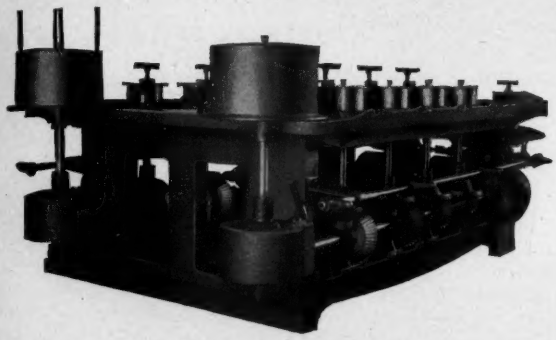
Working Machinery

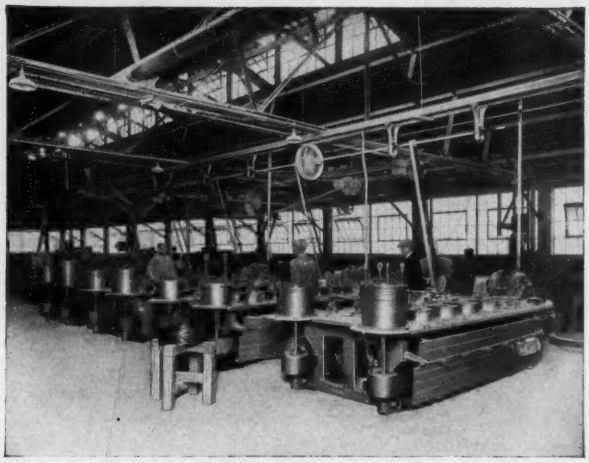
Sleeper & Hartley TRADE MARK

t Once—Reducing Overhead—Increasing Production!!

Double 5-Draft Dry, Intermediate

No. 14 to No. 23. High or low carbon wire.
3 to 4 Blocks to Average Operator.
No. 14 to 19—4 hole, 1400 lbs. per block.
No. 14 to 20—5 hole, 1100 lbs. per block.
More than 300 heads of this improved model in operation





Battery of Double Six-Draft Dry Continuous For High Carbon Wire

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Welding Wire Experience At Watertown Arsenal

Experiments supply interesting data on comparative values of alloy and carbon wire welds

IN a paper presented at the September meeting of the American Welding Society at Cleveland, Major T. B. Rose of the Ordnance Department of the United States Army, described his department's experimental investigation of numerous factors entering into welding in production work. The excerpts which follow have to do only with data on welding wire and constitute only a part of Major Rose's paper.

The Watertown Arsenal is the center for manufacture of anti-aircraft artillery carriages and of the heavier types of artillery carriages used by the Army. These structures involve extensive use of casting and structural plate. Sound castings are difficult to procure and even after they have passed the usual acceptance tests one is by no means sure that failure in service will not occur on account of shrinkage cracks or other defects undiscovered.

These and other considerations led the Watertown Arsenal during the past year to take up seriously under directions from the Chief of Ordnance the application of electric arc welding in building artillery. In addition to securing modern equipment of a varied type and personnel suitably trained, arrangements were made to carry along with production work experimental investigation of numerous factors which had a direct bearing on the work at hand or which would be fundamental in all welding.

The above tests are of interest as showing that the alloy wire weld gave lower yield points and higher tensiles than the carbon wire weld. It appears from this we may conclude

TABLE IV

Comparison of Tensile Tests of welds with bare and fluxed wire at different anneals.

	¾" Plate Y. P.	.23 to .305 Carbon T. S.	Double Bevel Weld Broke	Automatic Anneal
Bare	26,400	56,600	Outside Weld	None
Fluxed	29,400	50,100	In Weld	None
Bare	22,550	50,050	In Weld	1100° F.
Fluxed	21,500	43,900	In Weld	1100° F.
Bare	15,900	47,900	In Weld	1450° F.
Fluxed	15,000	46,450	Outside Weld	1450° F.
Bare	20,550	21,350	In Weld	1700° F.
Fluxed	17,900	30,900	In Weld	1700° F.

Each figure is average of two specimens A.S.T.M. Standard.

The results of tests shown in Table IV above indicate as far as strength of weld is concerned no appreciable difference between the bare and fluxed wire, but results are not conclusive as the welds were not in general as sound as they should have been. It does seem clear that annealing was undesirable, especially at 1450 deg.

TABLE V

Fatigue Test of Welds in ½" .23—.30 Carbon Plate Made in Upton-Lewis Machine.

Eccentric 1.5 inches.

Double Bevel Welds Ground Flat.

		C.	Mn.	Si.	S.	Ph.	Cr.	Va.
Wire	A	.17	.51	.01	.04	.015		
	B	.475	.63	.165	.023	.012	.90	.27
	C	.90—1.10	.10—.60	.02—20	.04	.05		

	No. of Reversals Failure Started	Complete	Anneal
Plate A	2023	2242	As Rolled
A	144	206	None
A	20	89	850° C.
*B	610	783	None
*B	295	512	850° C.
**C	112	190	None
C	296	375	850° C.

*These had better structure and penetration.
**Erratic.

Welding wire etc. should be normalized to secure the very best results. It remains to examine the qualities of welds made in normalized plate.

TABLE VII

Comparison of Welds in ¼" Structural Nickel Plate Made with Carbon and Alloy Wire

		C.	Mn.	Si.	S.	Ph.	Ni.	Va.
Plate		.45	.62	.215	.026	.014	3.33	
Wire	A	.17	.51	.010	.04	.015		
	B	.475	.63	.165	.023	.012	.90	Cr. .27

Y. P.	T. S.	Broke	Wire
38,870	74,770	In Weld	A
35,780	80,930	Outside Weld	B

Each figure average of six specimens

the alloy wire gives a more ductile weld, but of greater ultimate strength.

Under fatigue tests the superiority of the alloy wire is quite clearly shown in Table VIII above. It is also shown that annealing at 800 De. C. (1472 deg. F.) greatly reduces fatigue values. It is expected to extend

TABLE VIII

Fatigue Test of Welds in ¼" Structural Nickel Steel on Upton-Lewis Repeated Stress Machine.
Eccentric 1.5 inches.

	Reversals of Stress			
	Failure Started		Complete	
Original Plate	A.	1577	A.	2414
Annealed 800° C.	A.	1030	A.	1449
Welded with Cr. Va. Wire	A.	578	A.	690
	B.	244	B.	506
Welded with .17 Carbon Wire	C.	148	C.	244
Annealed 800° C.	B.	112	B.	220

Welds ground flat.

A. Average of 6 specimens. B. Average of 13 specimens.
C. Average of 7 specimens.

these tests, using nickel wire and a vanadium wire without chrome or nickel. The chrome-vanadium wire flows nicely and the vanadium is assumed to deoxidize and cleanse the weld, but we should like to get comparative results with other alloys.

Makers of welding wire must undoubtedly have much data along such lines, but it will probably be necessary for disinterested organizations capable of making research to finally make such information available to the public. The American Welding Society will naturally take the lead in this work, and I am sure its encyclopedia will become still more valuable and authorative.

Table IX presents the results of anneals below the critical range on welds made with three wires on nickel steel plate.

The Atomic Hydrogen Process was used. It here appears that the anneal at 600 deg. C. gave slightly better results, and would presumably more completely remove strains. All of the alloy wire welds broke in the plate itself. Comparing preceding tables one notes that all welds made in alloy plate appear stronger than when made with the same wire in carbon plate. This fact may be due to several factors, such as the thickness of plate, the different process used or the metallurgy of the weld.

It should be noted that in all the annealing mentioned above it was the practice to bring up to heat very slowly and hold for one to two hours, according to thickness of plate, and then slowly cool in furnace. It is believed soaking was adequate in all cases. The welds referred to above were built up with beads to represent production work, and the fact that some welds were stronger than the plate was in large degree due to increased section.

TABLE IX

Tensile Tests of Welds in ¼" Structural Nickel Plate with High and Low Carbon and Alloy Wire.
Atomic Hydrogen Process.

		C.	Mn.	Si.	Sul.	Ph.	Cr.	Va.
Wire	A	1.01	.42	.04	.03	.013		
	B	.475	.63	.165	.023	.012	.90	.27
	C	.17	.51	.01	.04	.015		
Plate		.45	.62	.215	.026	.014	3.33 Ni.	
		Y. P.		T. S.	Broke		Anneal	
	A	52,000		76,550	In Weld		As Rolled	
	B	51,900		88,500	Out Weld		As Rolled	
	C	52,250		84,550	One in Weld		As Rolled	
	A	53,150		79,250	One in Weld		300° C.	
	B	54,350		84,550	Out Weld			
	C	46,500		78,000	In Weld			
	A	53,300		86,800	One in Weld		450° C.	
	B	53,300		85,450	Out Weld			
	C	51,900		82,500	In Weld			
	A	55,750		77,700	One in Weld		600° C.	
	B	52,800		88,100	Out Weld			
	C	54,450		80,980	In Weld			
		53,300		86,400	Original Plate as bought			
		60,300		93,100	Plate as annealed 850° C.			

All welds perpendicular to direction of rolling. Each figure except last two lines average of two test specimens.

Progress of Wire Phonograph Record Invention

THE progress of a new wire invention was mentioned at the recent statutory meeting in London of the British Filograph Co., Ltd. Sir J. Hastings Seton, Bart., the chairman, said in his address that it was clearly stated in the company's prospectus that a certain amount of experimental work would have to be carried out in order to produce music records made on wire thread, and that the firm's scientific staff is now at work and is confident of solving the problem at an early date.

Professor A. M. Low, the famous physicist and inventor, is conducting a series of laboratory experiments that should provide most valuable data, and he is most enthusiastic as to the ultimate results. Mr. Wearham has conceived a method for the mass production of thread records which seems simple, inexpensive, and likely to be highly satisfactory. H. E. Cowley, who has had long experience in the production of records on a commercial basis, has joined the undertaking and is bringing his valuable knowledge to bear upon its problems.

The firm has secured an interest in a concern selling phonograph components of novel design. Patents have been applied for throughout the world. The chairman concluded by saying those present would appreciate that the firm's activities were a source of considerable interest and moment to those already engaged in the phonograph trade and that therefore it would be impolitic for him to say more at the present time.

DIGEST *of* RECENT TRADE LITERATURE

The Surging of Engine Valve Springs. Researches on Springs, No. 4. National Department of Scientific and Industrial Research (Great Britain). H. M. Stationery Office, No. 4.

Report of investigations to determine the synchronous speeds of vibration of engine valve and aircraft coil springs under various conditions of load and tappet clearances, to record the amplitude and frequency of these vibrations and to measure the extension and compression of a given coil additional to that imposed by the normal cam lift. Although various classes of vibration were detected, the simple case in which a wave, propogated by the impact of the cam, travels up the spring and is reflected from end to end, was found to be the most serious in its effect. From the data obtained by measuring the additional extension and compression of the coil one pitch distant from the end it was deducted that the increase of maximum stress due to surging could be as much as 40 per cent. The range of stress could also be considerably widened. By the application of suitable dampers the surging can be easily eliminated but this necessitates the addition of extra parts and it is considered that such additional weight would be more usefully employed in the springs themselves by designing them to withstand a stress at least 40% in excess of that imposed by the normal cam action.

The Spotting of Plated or Finished Metals. Bureau of Standards Journal of Research. June, 1929. P. 1086.

The first problem selected for study in a research project financed by the American Electroplaters Society was the "spotting out" of plated finishes, a defect which gives serious trouble in a number of industries. The investigation disclosed two distinct defects having different causes and remedies—"crystal spots" and "stain spots". For crystal spots the remedies proposed are (a) exclusion of sulphur from the surroundings, (b) the use of lacquers found to retard spotting, (c) the application of a thin film of grease such as petrolatum to the lacquered surface, and (d) the use of wax paper for wrapping. For stain spots the two most effective remedies are (a) permitting the chemicals to exude or spot out by exposing the articles to high humidity before the final finishing and (b) the application of a lacquer which has been found to retard this type of spotting.

Effect of Temperatures Attained in Overhead Electric Transmission Cables. The Institute of Metals, London, England.

A paper presented at the Dusseldorf meeting of the Institute in September by A. V. Zeerlever, Dr-Ing., and P. Bourgeois, D. Sc., respectively Chief Engineer and Assistant Chemist, Research Department, Aluminum Industrie A. G., Neuhausen. The increases of temperature produced by a current of electricity in transmission cables made, respectively, of copper, pure aluminum, steel-aluminum, and Aldrey were measured. Cables consisting of these materials were submitted to temperatures lower than the usual annealing temperatures for periods ranging over several months up to one year, and the effect on the mechanical properties was examined. It was found that Aldrey is not affected by temperatures which will seriously diminish the tensile strength of copper. Cables consisting of aluminum alloys having undergone previously an appropriate heat-treatment — such as Aldrey—are thus able, in spite of their lower electrical conductivity, to be loaded with higher current densities than copper cables, without danger of slow annealing.

Trade Literature Received

Materials Handling

"The New Red Head". Bulletin No. 120. Barrett-Cravens Company, 1328-1342 W. Monroe St., Chicago. Illustrated bulletin describing a lift truck for skid handling with a new patented lifting mechanism which insures safety, time saving and a minimum amount of handling effort.

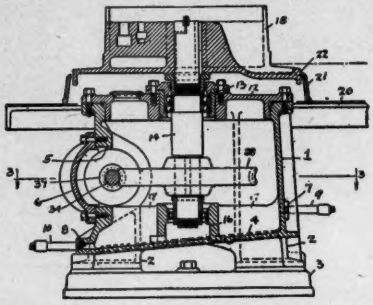
Chain Drives

"Ramsey Silent Chain Drives." Ramsey Chain Company, Inc., Albany, N. Y. 88 pages. Illustrated from photographs and diagrams. Catalogue demonstrating application and advantages of this type of drive for factory and mill machinery where moisture, oil, dirt and similar unfavorable conditions make other types of drives troublesome or unsuitable.

Alloy Steel

"Enduro KA2 Steel". Enduro Development Committee. Handsomely printed and profusely illustrated brochure featuring products made from Enduro Nirosta Steel by American manufacturers licensed under Krupp patents. The manufacturers represented are Central Alloy Steel Corp., Massillon, Ohio; Ludlum Steel Company, Watervliet, N. Y., The Babcock & Wilcox Tube Co., New York, N. Y. Illustrations and descriptions include numerous applications of the alloy to uses requiring corrosion resistance and high strength with ready workability. There are several supplementary pages of data on chemical and physical properties.

A REVIEW *of* RECENT PATENTS



Wire Drawing Mechanism 1,723,316

No. 1,723,316, WIRE DRAWING MECHANISM. (Patented August 6, 1929), by Philip V. Tippet, of Cuyahoga Falls, Ohio, assignor to the Vaughn Machinery Company, of Cuyahoga Falls, Ohio. Generally, the object of the present invention is the provision of a self-contained unit comprising an individually driven wire block suitably mounted on a stand and having a motor connected therewith through a worm and worm gear drive housed in such stand and having associated with the latter the necessary devices for controlling the speed of the motor and thus of the particular block driven thereby.

No. 1,725,356, COILED SPRING ATTACHMENT. (Patented August 20, 1929), by Walter Kiwi, of Philadelphia, Pennsylvania, assignor to Coates E. Landell, of Philadelphia, Pennsylvania. The leading object of the present invention is to provide a group of coiled springs so connected as to provide flexibility whereby the coils as a group may be compactly rolled for transportation and storage purposes. Both the top and bottom coils of adjacent springs are loosely connected together at diametrically opposite points by means of individual compact wire rings, each ring comprising a number of concentrically wound strands of wire.

No. 1,725,012, NOZZLE FOR ATOMIZING WIRE SHAPED MATERIALS. (Patented August 20, 1929), by Nicholaus Meurer, of Berlin-Neukolln, Germany, assignor to Metallogen Gesellschaft Mit Beschrankter Haftung, of Berlin-Neukolln, Germany. This is a nozzle system for atomizing wire-shaped material, which has been fused from the solid to a fluid state, by means of a gaseous medium under pressure, comprising in combination an inner, an intermediate and an outer nozzle, a rotatable mouthpiece on the outer nozzle, the open end of the mouthpiece being oblique with respect to the axis of the nozzle, a ball bearing between the rotatable mouthpiece and the outer nozzle, a turbine rotor on the rotatable mouthpiece and a set of guide blades between the outer and intermediate nozzles for conveying a portion of the atomizing medium to the rotor.

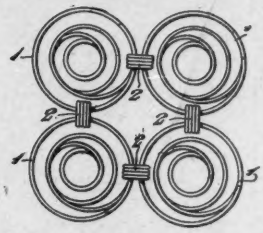
Complete descriptions and drawings of any of the patents referred to on this page may be had for twenty five cents. Address orders to Wire & Wire Products, 551 Fifth Avenue, New York City.

No. 1,724,134, LUBRICANT FOR WIRE DRAWING. (Patented August 13, 1929), by Charles V. Iredall, of Bloomfield, New Jersey, assignor to Westinghouse Lamp Company, A Corporation of Pennsylvania. To reduce die wear and facilitate drawing, the inventor has developed the following: a mixture of powdered graphite, a gelatinous suspending medium composed of agar-agar dissolved in water and from about .75 to 1% by volume of Turkey red oil.

No. 1,726,137, REEL FOR CABLES AND WIRE. (Patented August 27, 1929,) by Thomas Suarez y Bernal, of San Juan, Porto Rico. This present invention relates to reels for cables and wire, and more particularly, to a reel that will enable the wire or cable to be unwound without the necessity of lifting or jacking up the reel from the ground and without the necessity for removing the lagging from the entire circumference of the reel. This is a continuation in part of application Serial No. 148,943, filed November 17, 1926.

No. 1,725,540, CABLE WRAPPING MACHINE. (Patented August 20, 1929, by Holton D. Robinson, of New York, N. Y. This invention relates to machines for wrapping wire about the cables of suspension bridges and is an improvement of the machine illustrated and described in the patentee's previous patent for cable wrapping machines, dated February 28, 1911, No. 985,763. In this present invention, the patentee supports the machine by means of a segmental saddle adapted to rest on the unwound portion of the cable and to be moved by the crowding action of the wire last wound, lengthwise of the cable, without rotating thereabout.

No. 1,723,215, MANUFACTURE OF WIRE AND TAPES FOR LOADING TELEPHONE CONDUCTORS. (Patented August 6, 1929) by Willoughby Statham Smith, of Newton Poppleford, and Henry Joseph Garnett, of Sevenoaks, England. As a formula for carbon free wires for the purpose the inventors give: nickel 30% to 33% of the whole, iron 58% to 65% of the whole, and copper 2% to 6% of the whole.



Coiled Spring Attachment 1,725,356

No. 1,723,862, PROCESS FOR THE MANUFACTURE OF DRAWN TUNGSTEN WIRES. (Patented August 6, 1929), by Richard Jacoby, of Berlin, Germany, assignor, by Mesne Assignments, to General Electric Company, of Schenectady, New York. The process comprises developing the wire from an initial body containing longitudinal bodies whose crystallizability differs from that of the rest of the substance of the initial body; treating by heat whereby the crystallization process is caused to progress along the longitudinal bodies, and a union of crystals in a direction across the cross section of the wire is prevented, and a wire is obtained whose permanent structure is characterized by the majority of its crystals having a length that is several times greater than the diameter of the wire.

No. 1,725,114, WIRE STRIPPER. (Patented August 20, 1929), by Frederik Marinus van Gelderen, of Enschede, Netherlands. In order to remove insulation from covered wire, the inventor provides a small device provided with an inclined knife adapted to cut thru the insulation along a helical line so that the covering may be "unwound" or forced off the end of the wire.

No. 1,724,477, SAFETY PIN. (Patented August 13, 1929). by William O. Harris and Frank C. Kohler, of San Francisco. California. The invention comprises a safety pin constructed of a single piece of wire having a wedge-shaped point formed by flattening one end of the wire at right angles to the plane of the pin into a relatively thin structure and a wedge-shaped recess formed by the wire for receiving the point.

No. 1,726,165, WIRE ROPE SPLICING TOOL. (Patented August 27, 1929), by Thomas John Arthur Shepherd, of Waitaanga, New Zealand. This invention has been devised with the object of providing an improved tool for use in the operations of wire rope splicing. as for instance splicing two ends together by the well known inlaying system, and the formation of eye splices upon a rope end. The tool is intended to replace the ordinary marlin spike generally used.

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Domestic Exports and Imports of Iron and Steel Wire and Wire Products

Exports of iron and steel wire and wire products from the United States in June and July, 1929
(In gross tons)

Item	July 1929	June 1929	July 1928	January through July 1929	January through July 1928
Wire rods	5,822	2,774	3,638	28,882	22,167
Plain wire	3,591	3,789	3,264	29,728	26,936
Barbed wire and woven wire fencing	5,695	6,395	5,537	41,383	43,963
Wire cloth and screening	125	150	216	1,037	1,065
Wire rope	736	738	386	4,658	2,964
Insulated wire and cable	56	45	84	650	372
Other wire and manufactures of	1,258	1,017	1,060	7,049	5,464
Wire nails	1,352	952	1,425	9,210	10,032
Nails other than wire	962	868	784	5,968	5,641
Tacks	71	60	53	414	454

Imports

Imports of iron and steel wire and wire products into the United States
(In gross tons)

Item	July 1929	June 1929	July 1928	January through July 1929	January through July 1928
Wire rods	1,242	1,336	595	9,838	10,012
Barbed wire	577	612	226	3,542	1,975
Round iron and steel wire	490	295	408	3,756	2,440
Steel telegraph and telephone wire	.....	.....	10	.....	153
Flat wire and strip steel	137	162	132	1,240	1,339
Wire rope and strand	247	256	168	1,511	971
Other wire	17	85	42	366	320
Nails, tacks, and staples	800	1,079	1,020	5,340	4,863

Preliminary figures for United States electrical wire and wire product exports
(In dollars)

Article	July		7 months ended July 31	
	1928	1929	1928	1929
Insulated wire and cable, iron or steel	$ 22,517	$ 21,371	$ 137,663	$ 240,089
Copper, bare wire	509,216	308,379	1,657,961	2,179,631
Copper, insulated wire and cable	394,373	504,612	2,705,832	3,897,005
Insulating material	131,851	178,412	780,880	863,065
Other wiring supplies and line material	88,642	119,228	556,797	815,274

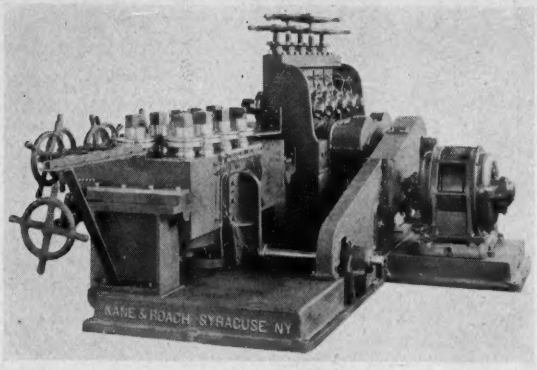
IMPORTS of card clothing again increased — totaling 27,765 square feet, valued at $44,494, against the June total of 22,494 square feet. Almost the entire trade was with the United Kingdom, 22,623 tons of the total coming from that source. Imports of wire cloth and screening were less, however, than in June, amounting to only 49.563 square feet, against 67,579 square feet received in June. Germany and France were principal sources of imports, with Canada supplying about one-half as much as either.

The trade in wire heddles increased slightly and aggregated 4,267,000 pieces, against the June total of 4,235,000 pieces. These heddles were drawn from but three sources—France supplying 2,146,000 pieces, Switzerland 1,112,000 pieces, and Germany 1,009,000 pieces.

Wood-screw imports were much lower in July, dropping to 28,816 gross, valued at $2,907, from the June figure to 46,015 gross, valued at $8,597. Of the total, 28,360 gross came from Sweden, very small quantities of German, Canadian, and Czechoslovak screws coming in.

New Wire Handling Equipment

New Roll Straightening Machine



WITH the steel mills running at full capacity, of particular interest at this time, is the announcement by Kane & Roach, of a complete line of Combination Vertical and Horizontal Roll Straighteners. They now offer this type machine in seven sizes. Both Horizontal Roll Shaft and Vertical Roll Shaft units are furnished in any combination of these straightening units.

Roll Shafts are of special analysis chrome manganese steel, accurately ground and machined. Reduction and drive gears are of special analysis forged cut steel. Where required, heat treated gears are used. Drive pinions are of special analysis forged steel, cut out of the solid, heat treated and ground. Reduction and drive gears run in oil tight gear boxes. Motor chain and sprockets are guarded by heavy cast iron guards.

After careful study of various lubricating methods, the company has standardized on the Alemite lubricating system. Any other system of lubrication can be supplied in place of standard Alemite system, in accordance with the customer's specifications.

These machines have a delivery speed of from 60 to 300 feet per minute. The Rolls are designed for handling rounds, flats, squares, angles, U-bars, Z-bars, hexagons, octagons, chains, I-beams, railroad rails, pipe, special shapes, hot roll window castings, etc.

Wire Tie Binding for Parcel Post

WITH the introduction by the Gerrard Co., 1492 South 52d Avenue, Chicago, of a metal tie binding method for packages in the small unit class, the solution of the problem of complete protection seems to have been found. Under this method, the package is tightly bound with coppered wire and sealed under tension by means of a special sealing device. The tie or seal is a twisted splice so smooth as to permit rubbing the hand over it without danger of injury, and having a strength equal to that of the wire itself.

The machine itself is about as large as one's hand and weighs less than three pounds. The wire is fed from a coil held in a special container, which prevents tangling. About a half second is required for the trying operation. The manner of application is as follows:

The machine is placed on top of the package and the wire end inserted in the left-hand gripper. The wire is then looped around the package and threaded through the machine. A single throw of one lever, forward and backward, tensions,

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(U. S. Patent 1,624,027. April 12, 1927.)
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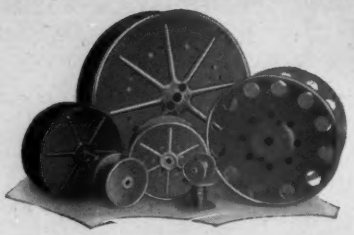

Cutting Costs - in - Wire Work

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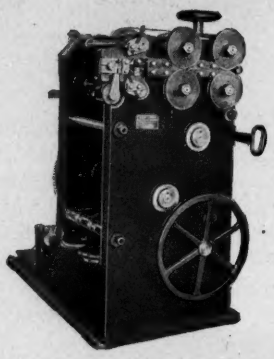
Improved Spring Coiling Machine



A spring coiling machine of improved design is being supplied by Sleeper & Hartley, Inc., Worcester, Mass., manufacturers of wire forming equipment.

The wire is gripped between feed rolls and is fed forward against the coiling tools, being rolled by deflection into the helical form.

A pre-determined length of wire is put into each spring. The cutting mechanism is automatic, each spring, as produced, being cut off at once. The machine will handle either round or square wire. Changes from one form of spring to another are made in from 10 sec. to 20 min., the time depending upon the complexity of the form. Springs may be wound either right or left hand, open or close coiled, of various diameters, coned with any degree of taper, with variable pitch, barrelled with any desired crowning, to almost any variable contour, tapered at one or both ends, and with one or more coils closed at one or both ends of the spring.

Eleven sizes of the machine, with capacities ranging from wire of 0.004 in. to 5/8 in. diameter, are built.

Conference Recommends Wire Rope Research

SOME fifty engineers broadly representative of the many fields of wire rope use met in New York, September 13th, at the Third Wire Rope Conference in the Engineering Societies Building and adopted the following resolutions: Whereas the discussion at this Conference has revealed: 1. That wire rope is subjected to many and varied conditions of service; 2. That there is great variation in the life of wire rope; and 3. That there seems to be no accurate method of predicting wire rope life or of determining when its useful life is up. Be it resolved that a cooperative research committee be organized under the auspices of Engineering Foundation and The American Society of Mechanical Engineers and with the cooperation of other interested technical organizations to make a study of the factors affecting wire rope life for the purpose of: 1. Formulating rules of recommended practice for the use and inspection of wire rope; 2. Emphasizing the factors to be considered in applying wire rope to its various uses; and 3. Pointing out possible improvements that might be made in the design, materials, and fabrication of wire rope and wire-rope-using machinery. Be it further resolved that the research adopted be developed according to the present research procedure of The American Society of Mechanical Engineers.

This resolution resulted from the discussion of a series of twelve papers presented at the Conference which pointed out the use and abuse that wire rope receives and the problems that press for solution.

Among the distinguished participants in the Conference were Mr. Elmer A. Sperry, President of The American Society of Mechanical Engineers and Dr. Conrad Matschoss, Director of the Verein Deutscher Ingenieure of Germany. Mr. Sperry emphasized the present need for a better knowledge of wire rope and described a new method of non-

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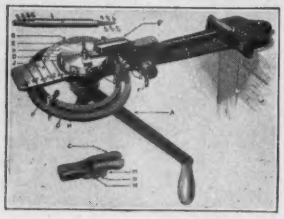

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destructive test that is showing great promise. Dr. Matschoss outlined the important research work that is being conducted in Germany on this widely used machine element and offered the cooperation of that committee to the proposed American project. Further evidence of the exhaustive study being given wire rope abroad was revealed in a paper by Dr. W. A. Scoble, Reporter for the Wire Ropes Committee of The Institution of Mechanical Engineers in Great Britain.

Those presenting papers included engineers well known in their various fields: Professor G. P. Boomsliter of West Virginia University, covered mining problems; several speakers discussed industrial hoisting problems. Additional papers on the program were by Prof. Emanuel Fritz on logging; D. C. Sherman, on cableways; O. E. Hovey on suspension bridges, and A. V. Bouillon on Marine use.

Modern Tendencies in Wire Drawing

(*Continued from page 338*)

of ultimately solving the problem is the multidraft continuous or semi-continuous machine.

Continuous wire drawing machines are not new, even for heavy sizes. Copper and alloy wires have been drawn on them for many years, but their adaptation to the coarser sizes of steel wire is comparatively new and is still in a stage of development. The ordinary continuous machine is of the "slip" type—that is, the intermediate receiving drums run faster than the wire which they deliver, and depend upon a rapidly alternating gripping and releasing to effect the traction necessary. This has been eminently successful on fine gages practically to the exclusion of the old style frames.

With coarser sizes, the question has been more difficult owing to the abrasion of the

drums. Renewable liners have been provided but the deleterious effect of the removal of the coating on the wire and subsequent cutting out or scratching of the wire remain. This condition seems to have been helped by a semi-continuous machine in which each block takes up wire at its own speed and delivers it as required by the succeeding block, from a previously provided reservoir on the block itself, at a rate which may be either faster or slower.

With this type of equipment equally as well as with frames, the possible productions are predeterminable in accordance with the formulas already cited.

To go back to the results developed in the first part of the paper for drawing 4 drafts to 14, the possible 10-hour production of any type of equipment drawing 300 lb. bundles with a chore time of 7¼ minutes is 25,000 lbs. approximately. This would correspond to the production of nearly seventeen average rod blocks, and would require approximately 3 finishing blocks 22″ in diameter running 140 RPM to draw on continuous machines.

The "standard" equipment for 300 pound bundles finishing 14 gage is two machines per man, or at 140 RPM on the 22″ finishing block, 806 feet per minute per machine, or 967,800 feet in ten hours, total. This corresponds to a production of 16,500 pounds in 10 hours at 100% efficiency. The greatest possible efficiency is determined by the threading time plus running time, and in this case is 21.8 minutes plus about 5 minutes for threading, or 26.8 minutes. This figures about 81% efficiency, and therefore sets the maximum possible production at 13,365 pounds in 10 hours, or 53.4% of the ultimate machine efficiency.

In other words, a robot could produce 25,000 pounds a day on three machines—a man actually produces a maximum of 13,365 pounds a day on two machines.

Just how far continuous machine designers can go toward producing the theoretical maxi-

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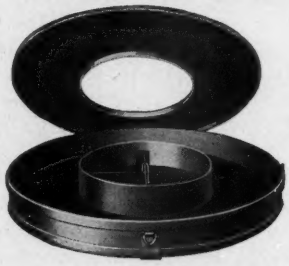

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mum is questionable, and the question is left for them to answer and demonstrate.

Objections to Continuous Drawing

The objections to continuous drawing are in part real and in part argumentative. We will list as many as come to mind, and endeavor to comment impartially.

1—Lack of Flexibility. The charge is made that machines are one purpose, and that alternate drafting cannot be performed. This was true at one time, and is now more or less so on the slip type of machines. In these the relative reductions are fixed by gearings, and a more or less definite relation must be maintained between drafts. With the accumulating block and independent payoff features, however, wide fluctuations may be made in drafting, and a great variety of sizes drawn.

This question also refers to a definite number of drafts being required. This brings up the point of desirability or, rather, applicability of continuous drawing, which will be discussed later.

2—Block speeds fixed, and therefore the first drafts are taken at an abnormally slow speed. This is true to a certain extent, and perhaps limits the number of drafts practicable to draw on one machine. We have split ten draft machines into two fives with a correspondingly greater total production. In general, however, the speed of drawing should increase with the finer gages, and this is what the continuous machine does. The answer will depend upon the economic features—floor space, cost, interest, etc.—as to the desirability of the continuous equipment.

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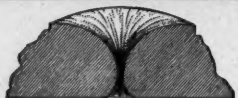

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3—Idleness of part of the machine in coarser gages are desired. This objection is valid in cases, but not in mills where equipment is properly designed. In other words, a continuous machine has its field.

4—First cost. The first cost of continuous rod machines has been more than rod frame equipment for the same capacity. Against this must be set the productive capacity, the floor space occupied, and the labor costs. Furthermore, the usual rod frame has cast gears, is wasteful of power, and has a fairly high maintenance factor. The usual continuous machines are machined finished, self-oiling, and should not provide undue mechanical trouble.

Applicability of Continous Machines

The continuous machine has a definite field — multidraft work. It is not indicated for one or two drafts. If in designing the layout for a mill, single motor-driven blocks are supplied for this class of work, and continuous machines for the three, four or five draft work, the best features of each will be utilized. For the finer gages, 8, 10 and 12 draft machines are made, but 8 or 10 drafts seem to be the greatest practicable number.

What of the Future?

The closed field for the continuous machine, as stated above, is the coarse wire requiring one or two drafts from the rod. This is true of itself, but are we so sure that even here the continuous machine has not a field yet undeveloped?

Enormous tonnages of 8 to 10 gage wire are drawn from 5 rods. The suggestion has been made, and has been put into effect abroad, that by starting with a larger rod four or five drafts may be used in drawing 8 or 10 gage wire resulting in several advantages.

First, greater production in the rod mills by using a larger billet and opening up mill all the way through, maintaining finishing speeds, or by rolling a larger diameter rod from same size billet.

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Third, a stiffer wire for the nail mill.

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Fifth, greater ease and less expense in cleaning a 5/16 rod over the 5 rod.

The sole objection seems to be a greater cost for power for cold drawing over hot rolling, but this can easily be calculated and will probably be submerged by the savings along other lines.

This idea has aroused considerable interest in many mills, and is one of the developments of the future to be watched. Its possibilities are great.

What Equipment to Supply

The ultimate decision as to the type of equipment proper for a mill is one dependent upon many factors. The mill for a country with cheap and abundant labor might be entirely different from that recommended here. In general, the following features are to be taken into consideration and evaluated:

- Fixed charges
  - First cost
    - Interest on investment
    - Depreciation
  - Rental charges for floor space
- Operating costs
  - Labor per ton produced
  - Maintenance—oiling, etc.
  - Repairs — labor and material
- Supplies—lubricants, etc.
- Power

It is only after striking a balance sheet with the various debits and credits duly valued that the superiority of one type over the other may be determined. Conditions vary so that a prediction of the result is impossible and each case must be determined on its own merits.

While nothing conclusive as to the relative merits of various types of equipment was intended to be developed here, it is hoped that the basis for calculation and decision has been made clearer, and that an opportunity has been afforded for discussion by others interested in the subject.

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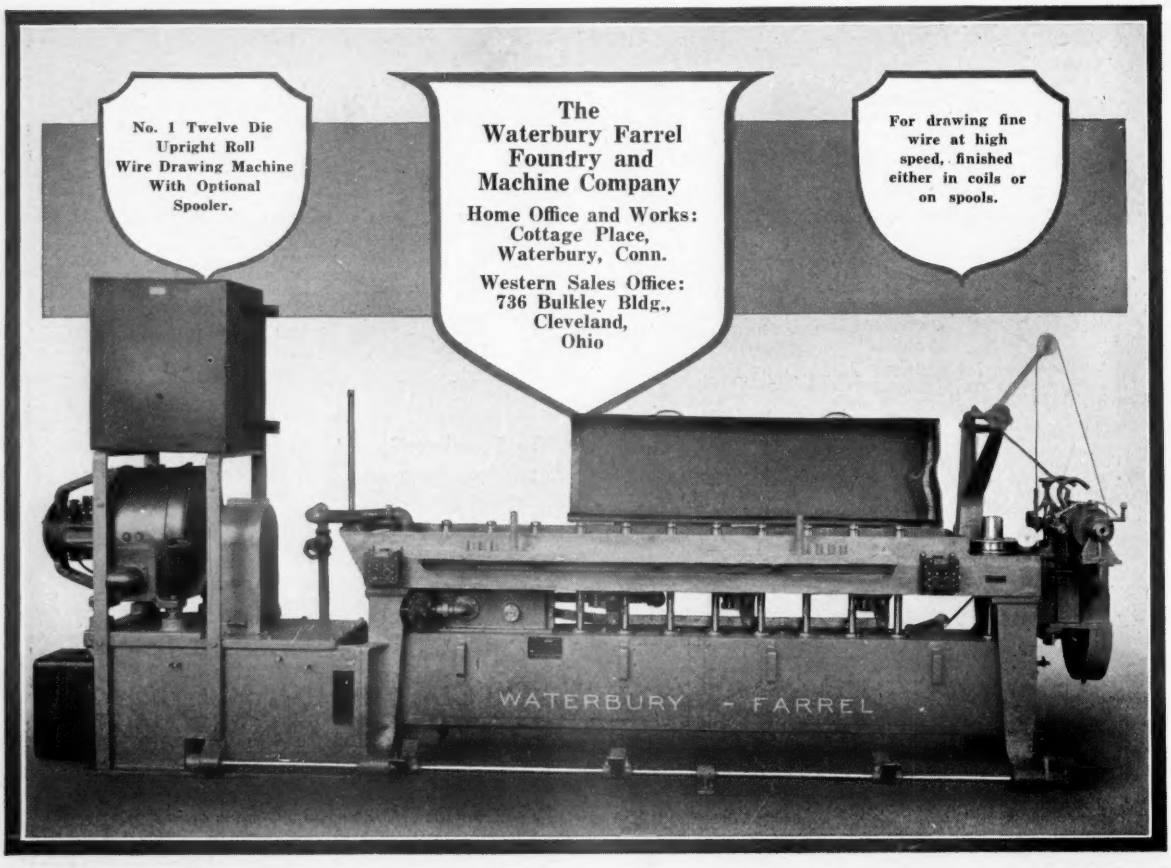
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIPPERS—Wire Block
J. A. Holmquist, Sharon, Pa.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.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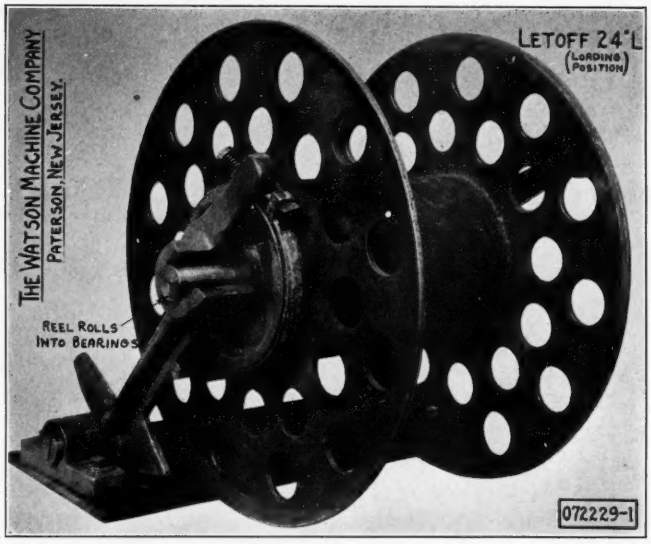

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